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INFORMATION SYSTEMS: THE CHALLENGE OF THE FUTURE FOR
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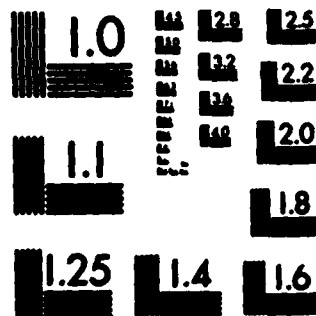
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A RAND NOTE

INFORMATION SYSTEMS: THE CHALLENGE OF THE FUTURE FOR THE AIR FORCE COMMUNICATIONS COMMAND

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PREFACE

This Note presents the text of a speech given at the semiannual Air Force Communications Command (AFCC) Commanders Conference, Homestead Air Force Base, Florida, on March 21, 1984. The material is based not on analytical research, but rather on the authors' combined five decades of experience with the Air Force on communications, computing, and information systems matters. The Note is intended to stimulate thinking, to raise issues for consideration, and to offer one view of a possible future for AFCC.

The speech was prepared under the Project AIR FORCE study effort "Technology Planning for Future Base-Level Communications Systems."



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SUMMARY

This Note examines the future of the Air Force Communications Command (AFCC). It presents views based on the authors' five decades of experience with the Air Force on communications, computing, and information system matters. Because of the recent Air Force initiative that combines the career fields and corresponding organizational alignments of data automation and communications, and that assigns the entire responsibility to AFCC, ^{the authors} we believe that AFCC will have to make significant changes in its posture and capability. For example,

- AFCC can and should make a force multiplier available to decisionmakers through information systems that provide timely status and option information.
- AFCC should be reorganized as appropriate to become the focal point of the Air Force for communications system and functional-area information system matters, rather than a service organization.
- It should become the requirements and advocacy focus for common-user communications improvements and systems, and for the development of functional-area information systems.
- It must oversee the training and career progression of the combined communications (30xx) and computer (51xx) career fields carefully and deliberately.
- It must acquire the capability to perform systems analyses and other technical studies that support its programmatic and advocacy proposals and relate them to mission effectiveness.
- AFCC should become the "Air Force Information Systems Command."

INFORMATION SYSTEMS: THE CHALLENGE OF THE FUTURE FOR THE AIR FORCE COMMUNICATIONS COMMAND

INTRODUCTION

The Air Force Communications Command (AFCC), as the focal command for computing and communications in the U.S. Air Force, is in a unique position at a unique time. It has an opportunity to make a significant difference in the future warfighting capability of the Air Force.

If the United States should become involved in a conflict in Europe or elsewhere, the U.S. Air Force, because of its worldwide commitments and ongoing budgetary constraints, would in many instances have to fight outnumbered. The enemy is likely to have more men, more ground equipment, and more aircraft, and also jamming devices and other significant electronic combat assets. The Air Force might even have to face opponents equipped with U.S. weapons and weapon systems. Therefore, what the Air Force must exploit are force multipliers--things that can give it a qualitative advantage to compensate for any quantitative disadvantage.

One largely unrecognized force multiplier is *a set of comprehensive information systems that provide timely, usable information to decisionmakers throughout the Air Force*. Fortunately, more and more senior Air Force leaders are coming to recognize the necessity for improved warfighting information systems.

Such systems include not only command and control to support all levels of decisions for force employment, but also systems to provide detailed instructions to the fighting units and to assure them of an ongoing flow of wartime resources. Information systems are also needed to provide a situation-assessment capability which, among other things, will determine where we are, where they are, what they are doing, what happened after the last attack, etc. Such a capability constitutes, in a sense, the "management information system" for fighting the war. There are of course many other information systems of varying complexity and size that are important to the Air Force--and all of them must involve AFCC.

Changes are now occurring in the perceived information systems requirements for areas that have been relatively well automated for years. A prime example is the base-level Maintenance Information System (MIS). The uncertainties of war, the need to have effective fighting units, and the need to maximize flexibility of each fighting unit collectively imply minimizing the structural and historically unchanging relationships among base-level maintenance, supply, and flying. If teleportation were only a reality and parts could be moved around as fast as data and information, the solution would be obvious--an efficient distribution system that could send parts along with data. Of course, no distribution system for physical items can ever approach this ideal, so theater parts-distribution systems (e.g., the European Distribution System) must be supported by an effective information system. In the future, communications and computers will have to be tied together to support functional capabilities that could not be foreseen twenty years ago when the present generation of base-level data systems was first conceived.

An era of information systems that are an integral part of warfighting capability has dawned; and AFCC is central to bringing the Air Force fully into the new world.

To clarify the connection between information systems and AFCC, we note that "information systems" is a term that has been used for a long time but is just now creeping into the organizational structure, culture, and jargon of the Air Force. Many systems (e.g., command and control, intelligence, supply, fusion) are referred to as information systems, but they are not always information systems in the truest sense; more often than not they are primarily data systems. Many of these systems inundate the user with data that he does not need, want, or recognize; most do not aggregate data in useful ways. Information is often portrayed awkwardly, and user interaction is not always natural. To be useful, an information system must coordinate, suggest, extract, and otherwise produce information that derives from data; and, equally important, it must offer that information to the user in a natural form that can be readily assimilated.

AFCC has had an important role in the data business over the years. It has provided the communications to support command and control systems that assign the right weapons to the right target at the right time; it provides both communications and computers to support functional-area data systems that get the right personnel to the right places at the right time, and get the right parts to the right aircraft for timely maintenance and repair. And it provides and maintains other on-base communication systems that support the sortie-generation process. But now AFCC has a much larger role to play in Air Force affairs: *It must get much more fully and directly into the information business.*

It is quite clear that present systems are primarily data-oriented and thus not adequate for multiplying warfighting capability, for which information is the pivotal need. It is also clear that the communications needs and capabilities of the Air Force must be fully integrated with those of its computer environments. Computer and communication technologies are twins that have made possible current data systems and can now, more importantly, provide the essential information systems.

AFCC will have to provide the Air Force with most of the comprehensive information infrastructure that produces a timely flow of information needed by decisionmakers, wherever they may be. It must also provide systems that can survive combat damage while keeping their critical information features operationally intact. Traditionally, such capabilities are associated primarily with command and control systems, but the information systems that support functional areas must have equal attention.

All of this constitutes a giant goal for AFCC. That goal has many aspects, but here we focus primarily on the integration of communications and computers, and on the requirements and planning process.

IMPLICATIONS FOR AFCC

Behavioral Change

It may not yet be obvious that AFCC has the action, but AFCC is the command to which the Air Force has given the assets for becoming its information systems focal point. This is a big responsibility, and it means that AFCC will have to behave differently than it has in the past--certainly differently from the ways in which it has traditionally been perceived by the rest of the Air Force.

Originally, AFCC was a "communications service" whose purview included the classical communication assets--telephone switchboards, teletypewriters, field wire, HF radio, Morse keys, etc. It then became a command and acquired the Air Force assets associated with base-level computing, especially the Data System Design Center (DSDC) at Gunter Air Force Station, along with the responsibilities they entailed. Until recently, however, it has not had an appropriate single point of contact in the Air Staff. But with the creation of the position of Assistant Chief of Staff for Information Systems, there is at long last an Air Staff office with which AFCC can interact across its full scope of activities.

It is important to realize that the new Assistant Chief of Staff for Information Systems is by no means what the Assistant Chief of Staff for Computer Resource Management (AFCR) was intended to be in the mid-1970s. In 1975, problems with embedded computer systems (especially avionics) caused the Chief of Staff to ask for a study that recommended (among other things) a focal point on the Air Staff for Computer Resources.¹ The major concern was that too many weapon systems suffered computer hardware and software shortfalls that affected Air Force warfighting capability.

¹Stephen M. Drezner, Hyman Shulman, and Willis H. Ware, *The Computer Resource Management Study: Executive Summary*, The Rand Corporation, R-1855-PR, September 1975; S. M. Drezner, H. Shulman, W. H. Ware, G. K. Smith, M. R. Davis, R. N. Reinstedt, and R. Turn, *The Computer Resources Management Study*, The Rand Corporation, R-1855/1-PR, April 1976.

In 1984, however, the driving factor is the awareness that information systems are crucial to warfighting capability. The issue has become much larger and more pervasive. Embedded systems are still very important, and failures in aircraft avionics are still critical, but the all-encompassing issue of information systems drives the changes AFCC must make.

What, then, is the problem? *The problem is making it happen; and making it happen means, in part, that AFCC will have to provide aggressive leadership to the Air Force.*

AFCC will have to provide the mechanisms for resolving conflicting needs for communication services, just as the DEDC adjudicates similar conflicts among the many functional-area users of base-level computing. But it will have to do so while maintaining maximum uniformity across all bases and allowing for command-unique arrangements. It will have to be the advocate for communication improvements, and it will have to relate such programs to mission effectiveness of the Air Force.

Thus, AFCC will have to provide the means for formally stating user requirements and relating them to major command (MAJCOM) mission effectiveness. In this connection, user needs cannot really be understood simply by asking the users. AFCC will have to do the comprehensive planning to translate user requirements into implementable programs of action. It will have to acquire the analytic skills necessary to make tradeoffs and will have to perform other studies that will guide choices among alternative technical approaches. It will have to be the reservoir of knowledge--both technical and operational--to which MAJCOMs, base tenants, and other users can turn for help in their own planning, requirements identification, and innovations. Finally, it may have to deal with system acquisition and/or project office issues.

This line of argument does not imply that AFCC has not provided leadership; it has done so, and it is doing so. However, AFCC must accelerate its change from the historical image of a service provider to that of an assertive leader in information systems. What was sufficient for traditional communications planning and data-systems implementation must be enhanced significantly for the environment ahead.

The leadership issue is particularly crucial because communications have historically been viewed as a service to be taken for granted. They have rarely been seen as an essential component of total information systems; rather, they have been treated as an O&M function dependent on the technical achievements of others. Moreover, the communications planning process has tended to be an amalgamation of user desires gathered at base level and coordinated upward, rather than a comprehensive top-level effort that assures the coordination of all aspects into a technically cohesive, flexible, adaptable, and expandable operational environment.

Unfortunately, AFCC has been viewed from a similar perspective-- as a taken-for-granted source of services--and it has in general molded and staffed itself accordingly. It has tended to behave reactively, because that is what was expected of it, and in former times that is what was needed. Today, the responsibility of supporting the Air Force in the information business will require AFCC to be a different and much more active, rather than reactive, command.

Information systems collectively have de facto become a major weapon system. The Air Force has not yet begun to treat them that way, and the phenomenon is just now being recognized. Except for command-control systems, information systems have generally not been thought of as a weapon system in the past, nor have they been treated that way in and by the Air Force culture. Communications in particular has been looked on as a support technology, with the emphasis on how fast or how securely binary digits could be moved from one place to another. Communications, even more than computer systems, have been taken for granted except when they do not work. Then, of course, the complaints are loud and vigorous.

There is increasing recognition and appreciation of the centrality of information systems to the mission of the Air Force. This has been truly appreciated in applications such as command and control information systems that are developed wholly within a MAJCOM and reflect a high command priority. While AFCC has been a participant in terms of providing some of the necessary communications or as the maintainer of a system, it has not been deeply involved in the

requirements process or with system design. It is essential that AFCC become involved in these two major areas.

Development in base-level information systems has been slower to mature than development in MAJCOM-centered command and control systems. The logistics community at the Air Staff was initially the major player in bringing base-level computing into a more cohesive posture. The people responsible for the functional areas of maintenance and supply observed that their activities could and should be performed basically the same way at every base, regardless of the host command. Eventually this conviction led to the formation of the DSDC, but its creation required that the logistics functional area give up manpower slots to provide the needed impetus.

Other functional areas, including finance and personnel, subsequently reached the same conclusion. The pivotal observation is that advances in base-level functional-area automation cut horizontally across MAJCOMs and their command prerogatives, in contrast to command-unique systems, which are vertically organized within a MAJCOM. In spite of the effective work done by the data-automation community of the Air Force, the across-command systems lag the in-command ones.

There are important differences between a command-unique system and base-level computing and communications, and those differences partly explain the difference in maturation rate:

- A command-unique system concerns only a MAJCOM and the bases that it owns. The system deals with a vertically integrated organization of the Air Force; and given resources and time, the commands will get their systems built.
- Base-level information systems must concern all bases. They are a horizontal responsibility across Air Force commands and organizations, just as is air traffic control, which AFCC supplies. Thus, they span organizational jurisdictions and intrude on organizational prerogatives.
- The requirements process, the advocacy position, and the top-level designs of base-level systems must function laterally across the Air Force, not just vertically within one command; but they must also be coordinated with many MAJCOMs and must

allow for the inclusion of command-unique features. This coordination requires that AFCC take a more visible and aggressive role in the requirements process.

AFCC has taken the following actions to move into the modern world:

- The consolidation of communications and computing within the Office of the Deputy Chief of Staff for Information Systems.¹
- The realignment of the Consolidated Communications Programming Center as an integrated part of the Gunter complex.²
- The blending of the career paths from the data automation field (51xx) and the communications field (30xx)--a difficult action fraught with problems.

However, there is much more to be done.

Blending Career Fields

It is not possible to simply put individuals from two disciplines into one organization and have integration automatically happen as a consequence of physical proximity. For example, in 1975 Project AIR FORCE did a special study for the Chief of Staff,³ which led to the formation by the Air Force of the Assistant Chief of Staff for Computer Resource Management (AFKR). Unfortunately, AFKR tried to integrate its responsibilities by simply bringing two disparate organizations under a common top manager. It did not work; the two sides did not share the intimacy of dialogue and activity that integration implies.

¹The initial action to consolidate computers and communications under a Deputy Chief of Staff for Teleprocessing was taken in late 1983. Renaming the office to the DCS/Information Systems (DCS/SI), however, occurred during the preparation of this Note.

²As of this writing, the new name for the group of organizations at or related to Gunter AFS (the DSDC and CCPC, among others) has not been determined.

³See Drezner, Shulman, and Ware, op. cit.; and Drezner, Shulman, Ware, Smith, Davis, Reinstedt, and Turn, op. cit.

The 51xx and 30xx career fields have developed from different directions, and with different people who have different interests and technical skills. This does not mean that the two fields cannot or should not be integrated; but it does mean that their historical and cultural differences must be accommodated.

The computer field has been developing rapidly for over three decades, with extremely active commercial growth. In contrast, the common-user communications environment has developed much less rapidly and has seen a real growth spurt only in recent years. These contrasting developments have unavoidably influenced the corresponding disciplines in the Air Force. Air Force officers in the 51xx field have had little trouble finding computer-oriented jobs in industry. With the rising importance of communications within industry, those in the 30xx field will now have similar opportunities.

It will take hard work to successfully integrate communications and computer people at bases, in commands, and in the management structure. There is no foolproof prescription, but the blending of the two career fields must be treated carefully and thoughtfully, with sensitive regard for the professional perceptions of the two groups of people. The downside risk is a wholesale loss of personnel that the Air Force cannot afford--especially when these people will be needed more than ever.

The upside opportunity will be for AFCC to manage career progression with insight and care. This may require longer tours of duty as 51xx and 30xx personnel struggle to learn each other's business.

Information systems have a tendency to highlight the problem of cutting across organizational boundaries. The early history of the Maintenance Systems Design Office (which later became the DSDC) illustrates the point and provides an example of the difficulty of integration. In this case, the difficulty was that of putting functional areas together, compounded by the problems of integrating across functional boundaries. Functional-area and computer specialists were originally combined in a single work environment in the DSDC. Together they tried to make sense of the unbelievably large number of requirements that had been generated by users. The DSDC recommended hardware and software actions; it built workable new systems and

maintained existing ones. It had all the signs of successful integration, yet there were visible gaps. The functional-area users became adversaries and competed for computer support on machines that had yet to be selected.

The Air Force is now older and wiser, and it has the experience of the DSDC to draw on; but it requires more than just the words of a policy change:

- Organizational integration is tough, and the Air Force must be aware of that as it proceeds.
- In this case, actions are being taken that will affect career paths and opportunities for an estimated 20,000 people. Relationships with the in-command authority structure will be disrupted. Not every individual will see the step as advantageous, nor will they all view it from "on high," as the Air Staff and Command Sections of MAJCOMs do.
- Integration will take a long time to become fully complete.
- Caution, careful explanation of the expected payoffs to Air Force mission effectiveness, and supportive information with regard to career opportunities are all fully warranted.

Requirements

The requirements issue is an essential aspect of AFCC's future. It will drive the evolution of future information systems. On-base information systems--including on-base communications--must have a mechanism to bring functional-area and MAJCOM users into a dialogue with technical people. Communications technology, an integral part of an information system, is probably the lesser appreciated of the twin technologies that the Air Force is now blending.

The DSDC provides a forum for the computer-oriented part of information systems, but there is no corresponding institutionalized forum in which user requirements for on-base communications can be related to mission effectiveness, efficiency of operations, wartime survivability, and similar metrics. Therefore, some mechanism must be provided for the on-base communications requirements analysis. This is a very important step, because ultimately communications needs will

compete with all other aspects of Air Force affairs, even though the Air Force recognizes the crucial importance of communications. There will never be enough funding to provide everything that everybody wants; base-level communications requirements that arise from MAJCOMs or functional areas will have to compete among themselves as well as with other demands. Therefore, the case for communications improvements must be stated clearly, with relevance to the items that are important to the Air Force and with pertinence for the users they support.

The "requirements process" is the mechanism that the Air Force uses to resolve conflicts among competing demands for its funds. AFCC must express communications requirements--especially on-base ones--in mission-oriented terms to have a maximum impact on the funding process.

There are analogies in the Air Force outside the communications/computer field--for example, intratheater airlift. The case for intratheater airlift was once argued in terms of moving more tonnage from one base to another or from one point to another. The argument was not successful. When examined in terms of warfighting capability as measured by sortie generation, however, intratheater airlift was shown to be equivalent to adding several thousand sorties per day. Suddenly, what was a mundane special argument became central to the Air Force's ability to successfully conduct a war. And, as they say, the rest is history.

There is a compelling argument for specialists to become totally involved in the requirements process. Computer specialists have already done so through the DSDC. Communications specialists must participate in the same way if AFCC is to achieve more than the occasional new initiative that arises from the concern or displeasure of some top-level officer.

A central means must be provided to bring together the diverse communications needs for bases; otherwise, the situation will continue to be more of the same:

- Relatively slow improvement by AFCC of the backbone cable system and telephone plant.

- Downward-directed actions from a MAJCOM for selected actions on specified bases.
- Individual--and largely uncoordinated--actions by tenants who use discretionary funds as they see fit.

If the past trend is allowed to continue, there is a real risk that awkward interfaces will arise among systems and will prevent communications traffic from being passed freely everywhere; or, equally disquieting, users may be constrained by technical impediments from making fullest use of on-base information systems networks. Such events could lead to the ultimate risk that the required information systems could not be built.

Bringing the Air Force into a new world of comprehensive war-fighting information systems requires AFCC capabilities that are at the very least multidimensional. They include, among others, technical skills, architectural skills, and analytical skills to determine which requirements are both desired and possible.

CONCLUSION

AFCC will have to do a very different job in the future. It cannot continue to behave as it has in the past, given the major change in its mission focus occasioned by recent Air Force actions:

- No longer can AFCC be a simple funnel for needs that arise at base level and that are aggregated upward, and for which AFCC is simply the spokesman in the budget process.
- AFCC must play an aggressive leadership role that will point the way and help direct the MAJCOMs and their bases.
- AFCC must become the leader with the analytic capability to do studies that
 - Can compete head-on with or supplement and complement, as required, similar studies from the MAJCOMs and the Air Staff,

- Will help resolve technical choices and will contribute to structuring a base to the detailed level,
- Will determine which user requirements are both desirable and possible, and
- Will present technical and programmatic alternatives plus costs to decisionmakers at each level of management.
- AFCC must function as the advocate for all cross-MAJCOM information systems and communications systems developments and improvements.

The Air Force has clearly indicated its intent by transferring so many computer and communications assets to AFCC. The only sensible response by AFCC, therefore, is to become the "Air Force Information Systems Command."

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